



Sake Lawrence 1450966
1 of 11

Jan 20



i) $\frac{3x-1}{5} = \frac{6x+5}{9}$

$$9(3x-1) = 5(6x+5)$$

$$27x - 9 = 30x + 25$$

$$-9 - 25 = 30x - 27x$$

$$-34 = 3x \quad x = \frac{-34}{3} = -11.33$$

ii) $1 + \frac{5}{x} = \frac{-6}{x^2} \quad 1 + 5x^{-1} = -6x^{-2}$

$$\log\left(1 + \frac{5}{x}\right) = \log(-6) - \log(x^2)$$

$$\frac{1}{x} + \frac{5}{x} = \frac{-6}{x^2} \quad \text{multiply by } x$$

$$1 + 5 = \frac{-6}{x} \quad 6 = \frac{-6}{x} \quad x = \frac{-6}{6} = -1$$

iii) $2 \log(3x+1) = \log(x+3) + \log(x+7)$

$$\log(3x+1)^2 = \log(x+3)(x+7)$$

Cancel logs

$$(3x+1)^2 = (x+3)(x+7) \rightarrow$$



1a)iii) $(3x+1)(3x+1) = (x+3)(x+7)$

$$9x^2 + 6x + 1 = x^2 + 10x + 21$$

~~$$8x^2 + 6x - 10x + 1 - 21 = 0$$~~
~~$$8x^2 - 4x - 20 = 0$$~~

~~$$\frac{4 \pm \sqrt{4^2 + 4(8)(-20)}}{2 \times 8} =$$~~

$$x = \frac{-b \pm \sqrt{b^2 + 4ac}}{2a}$$

~~$$\frac{4 \pm \sqrt{16 + 640}}{16}$$~~

$$8x^2 + 6x - 10x + 1 - 21$$

~~$$0 = -8x^2 + 4x + 20$$~~

$$8x^2 - 4x - 20 = 0$$

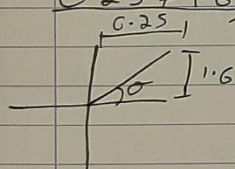
~~$$x = \frac{-4 \pm \sqrt{4^2 + 4(8)(-20)}}{2 \times 8}$$~~

$$x = \frac{4 \pm \sqrt{-4^2 + 4(8)(-20)}}{2 \times 8}$$

$$x = \frac{4 \pm \sqrt{-656}}{16} \quad x = 0.25 + 1.6j$$

$$x = 0.25 - 1.6j$$

$$0.25 + 1.6j$$



$$r = \sqrt{0.25^2 + 1.6^2} = 1.62$$

$$\theta = \tan^{-1}\left(\frac{1.6}{0.25}\right) = 81.12$$

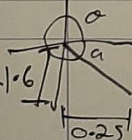
$$x = 1.62 (\cos 81.12 + j \sin 81.12)$$

$$0.25 - 1.6j$$

$$r = \sqrt{0.25^2 + 1.6^2} = 1.62$$

$$\theta = \tan^{-1}\left(\frac{1.6}{0.25}\right) = 80.54$$

$$\theta = 360 - 80.54 = 279.46$$



Sake Lawrence 1450966
3 of 11

Sen 22

1 a) $z = 1.62(\cos 279.46^\circ + j \sin 279.46^\circ)$

$$z = 0.25 + 1.6j$$

$$z = 0.27 - 1.6j$$

b) $8P^3Q^2 + 4P^2Q^3 + 2P^3Q$
 $(2PQ)^3$

c) ii) $x^2 - y^2$

$$(x + y)(x - y)$$

c) $x^2 + 12x + 20 = 0$

$$\begin{array}{r} 20 \ 1 \\ 10 \ 2 \end{array}$$

$$(x + 10)(x + 2) = 0$$

$$\underline{x = -10}$$

$$\underline{x = -2}$$

c) ii) $2x^2 + x - 15$

$$\begin{array}{r} 1 \ -15 \\ 3 \ -5 \end{array}$$

$$(2x - 5)(x + 3)$$

$$\underline{x = -3}$$

$$\underline{x = \frac{+5}{2} = 2.5}$$

→

Sake Lawrence 1450966
4 of 11

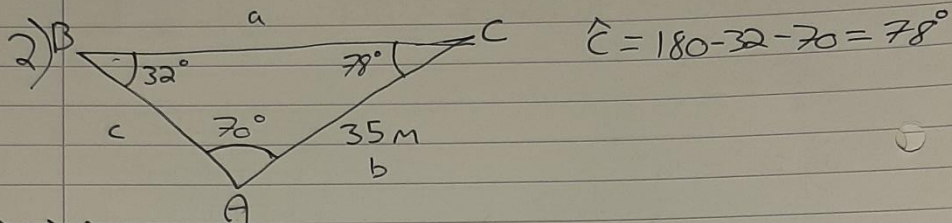
Jan 22

1ciii) $x^2 - 400 = 0$

$$(x + 20)(x - 20)$$

$$\underline{\underline{x = -20}}$$

$$\underline{\underline{x = 20}}$$



$$\hat{C} = 180 - 32 - 70 = 78^\circ$$

2) i) $\hat{C} = 78^\circ$

3) ii) $AB = c$

$$\frac{c}{\sin 78} = \frac{35}{\sin 32}$$

$$c = \frac{35 \sin 78}{\sin 32}$$

$$c = \frac{35(\sin 78)}{\sin 32}$$

$$\underline{\underline{AB = 64.6\text{m}}}$$

2) iii) $BC = a$

$$\frac{a}{\sin 70} = \frac{35}{\sin 32}$$

$$a = \frac{35 \sin 70}{\sin 32} = BC = \underline{\underline{62.06\text{m}}}$$



Sake Lawrence 1450966
Sof 11

Jan 22 $\frac{S}{T} \frac{A}{C}$



3ai) $\sin x = 0.67$

$$x = \sin^{-1}(0.67) = \underline{\underline{42.07}}$$

$$x = 180 - 42.07 = \underline{\underline{137.93}}$$

a ii) $\tan^2 x - 7 \tan x + 10 = 0$ $\frac{10}{25}$

$$x^2 - 7x + 10 = 0$$

$$(x - 2)(x - 5)$$

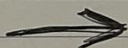
$$(\tan x - 2)(\tan x - 5)$$

$$(\tan x - 2) \quad x = \tan^{-1}(2) = \underline{\underline{63.43}}$$

$$x = 180 + 63.43 = \underline{\underline{243.43}}$$

$$\tan x - 5 \quad x = \tan^{-1}(5) = \underline{\underline{78.69}}$$

$$x = 180 + 78.69 = \underline{\underline{258.69}}$$



Sake Lawrence 1450966
G of 11

Ser 22

$$4) \begin{aligned} y &= 5x^2 + 12x - 14 \quad (1) \\ y &= 4x^2 + 3x - 4 \quad (2) \end{aligned}$$

$$(1) - (2)$$

$$0 = x^2 + 9x - 10 \quad (3) \quad \begin{array}{cc} 10 & 1 \\ 2 & 5 \end{array}$$

$$(x + 10)(x - 1)$$

$$\underline{x = -10} \quad \underline{x = 1}$$

$$y = 5(-10)^2 + 12(-10) - 14 = \underline{\underline{-634}}$$

$$y = 5(1)^2 + 12(1) - 14 = \underline{\underline{3}}$$

$$5a) \quad Z_1 + Z_2 \quad Z_1 = 3 + 7j \quad Z_2 = 2 - 10j$$

$$\underline{\underline{5 - 3j}}$$

$$ii) \quad Z_1 - \overline{Z_2} \quad Z_1 = 3 + 7j \quad \overline{Z_2} = 2 + 10j$$

$$\underline{\underline{1 - 3j}}$$

$$iii) \quad \frac{Z_1}{Z_2} \quad \frac{3 + 7j}{2 - 10j} \times \frac{2 + 10j}{2 + 10j}$$

$$(3 + 7j)(2 + 10j) = 6 + 10j + 14j + 70j^2$$

$$(2 - 10j)(2 + 10j) = 4 + 20j - 20j - 100j^2$$

20j's cancel $\rightarrow$

Sake Lawrence 1450966
7 of 11

Sen 28

5a) $\frac{6 + 10j + 14j + 70j^2}{4 - 100j^2}$

$$= \frac{6 + 24j - 70}{4 - 100}$$

$$= \frac{-64 + 24j}{-96}$$

$\therefore$

$$= \frac{-64}{-96} + \frac{24j}{-96}$$

5b) $7x^2 + 2x + 11 = 0$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-2 \pm \sqrt{2^2 - (4 \times 7 \times 11)}}{2 \times 7} = \frac{-2 \pm \sqrt{-304}}{14}$$

$$= \frac{-2 \pm \sqrt{304}}{14} \quad x = \frac{-2 + 17.4j}{14}$$

$$x = -0.14 + 1.24j$$

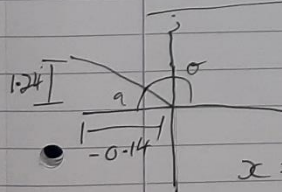
$$x = -0.14 - 1.24j$$

$$x = -0.14 + 1.24j$$

$$r = \sqrt{1.24^2 + 0.14^2} = 1.25$$

$$\alpha = \tan^{-1} \frac{1.24}{0.14} = 83.56$$

$$\theta = 180 - 83.56 = 96.44$$

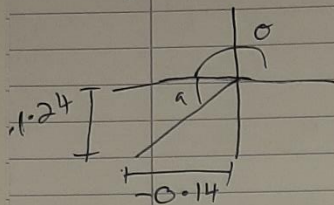


$$x = 1.25(\cos 96.44 + j \sin 96.44)$$

Sake Lawrence 1450966
8 of 11

Jan 22

5b) $x = -0.14 - 1.24j$



$$r = \sqrt{1.24^2 + 0.14^2} = 1.25$$

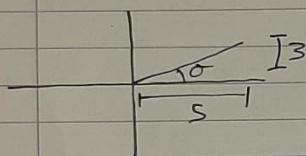
$$\alpha = \tan^{-1} \frac{1.24}{0.14} = 83.56$$

$$\theta = 180 + 83.56 = 263.56$$

$$x = 1.25(\cos 263.56 + j \sin 263.56)$$

5c) $(5 + 3j)^4$

$$n = 4$$



$$r = \sqrt{3^2 + 5^2} = 5.8 = \sqrt{34}$$

$$\theta = \tan^{-1} \left(\frac{3}{5} \right) = 30.96$$

$$\sqrt{34}^4 (\cos(4 \times 30.96) + j \sin(4 \times 30.96))$$

$$1156(-0.56 + 0.83j)$$

$$-647.36 + 959.48j$$



6a) $y = 9x^3 + 7x^2 - x + 4$

$$\frac{dy}{dx} = 27x^2 + 14x - 1 + 0$$

ii) $y = (2x+3)(3x-5)$

$$6x^2 - 10x + 9x - 15$$

$$\frac{dy}{dx} = 12x - 10 + 9 - 0$$

$$\frac{dy}{dx} = 12x - 1$$

iii) $y = 2\ln x + \frac{5}{x}$ $y = 2\ln x + 5x^{-1}$

$$\frac{dy}{dx} = 2\left(\frac{1}{x}\right) - 5x^{-2}$$

iv) $y = 7 \sin x + 3 \cos 2x + \tan \frac{x}{2}$

$$y = 7\sin x + 3\cos 2x + 6\sin 2x$$

$$\frac{dy}{dx} = 7\cos x + (3 - 2\sin 2x) + -2\sec^2(-2x)$$

v) $y = \frac{e^{3x}}{x^3}$ $y = e^{3x} x^{-3}$ $u = e^{3x}$
 $v = x^{-3}$

$$\frac{du}{dx} = 3e^{3x} \quad \frac{dv}{dx} = -3x^{-4}$$

$$\frac{dy}{dx} = e^{3x}(-3x^4) + x^3(3e^{3x})$$



Sake Lawmree 1450966
10 of 11

5m 22

Qa) $y = (5x^2 - 2x + 1)^5$
vii)

$$= 5(5x^2 - 2x + 1)^4 \quad 10x - 2$$

$$\frac{dy}{dx} = 5(5x^2 - 2x + 1)^4 (10x - 2)$$

$$\frac{dy}{dx} = (50x - 10)(5x^2 - 2x + 1)^4$$

7a) i) $\int x^5 + 2x^2 + x - 10 \, dx$

$$= \frac{x^6}{6} + \frac{2x^3}{3} + \frac{x^2}{2} - 10x + C$$

ii) $\int (2x + 5)(x^2 - 1) \, dx$

$$2x^3 - 2x + 5x^2 - 5$$

$$= \frac{2x^4}{4} - \frac{2x^2}{2} + \frac{5x^3}{3} - 5x + C$$

iii) $\int_2^5 2x^2(x^2 + 3) \, dx$

$$\int_2^5 2x^4 + 6x^2 \, dx = \frac{2x^5}{5} + \frac{6x^3}{3}$$

$$\left[\frac{2(5)^5}{5} + \frac{6(5)^3}{3} \right] = 1500$$

$$\left[\frac{2(2)^5}{5} + \frac{6(2)^3}{3} \right] = 28.8$$

$$= 1500 - 28.8 = 1471.2$$



Sake Lawrence 1450966

Sen 2d



11 of 11

Qa)
iv)

$$\int 5 \sin 3x - \cos \frac{2x}{3} dx$$

$$\int 5 \sin 3x - \cos 3x \cos -3x dx$$

$$= \left(5 - \frac{1}{3} \cos(3x) \right) - \left(\frac{1}{3} \sin(-3x) \right) + C$$

$$= \left(5 - \frac{1}{3} \cos(3x) \right) - \left(-\frac{1}{3} \sin(-3x) \right) + C$$

